

3 (5)

AUTHOR:

Karlov, N. N.

SOV/20-127-3-46/71

TITLE:

On Some Morphological, Sculptural, and Petrographic Particularities of Faceted Glacial Pebbles

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 127, Nr 3, pp 637 - 640 (USSR)

ABSTRACT:

The faceted glacial pebbles have so far been little investigated. They are characterized by one or two facets which are brought about by (a) primary origin - by grinding and polishing when carried along with the flowing glacier, and (b) secondary origin - by Aeolian grinding and polishing in the periglacial zone already after the melting of the ice, i.e. by dry and cold winds blowing from the receding glacier. In order to draw paleo-geographical conclusions, it is important to determine whether type (a) or (b) took place. Type (b) was discussed by the author at some other place (Ref 2), type (a) is discussed in this paper. (1) Flat-iron or cuneiform shape is most typical of pebbles after primary grinding by the glacier (Fig 1: 1 and 2). They are characterized by a considerably flattened basic triangular facet and two steep curved or somewhat flattened side slopes which in front (as compared with

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On Some Morphological, Sculptural, and Petrographic SOV/20-127-3-46/71  
Particularities of Faceted Glacial Pebbles

the direction in which the glacier moves) concur under an acute angle; the rear end of this "flat-iron" is broadened, all edges are blunt, the back is rounded, however, not roof-shaped; as is the case with typical Aeolian "triangular" bodies. Some of the pebbles formed by the glacier show other shapes which resemble those polished in Aeolian manner at first sight; however, they can always be distinguished by characteristic features. (2) The facets of polyhedral glacial boulders of small size (1-10 cm) are even and smooth, sometimes shining like a mirror, and usually geometrically regular (Fig 1: 3-10). Aeolian pebbles, however, never show such regular shapes. (3) Pebbles shaped by ice show obtuse two-faceted re-entering angles formed by two differently oriented facets (Fig 1: 3-5). This is never the case with Aeolian pebbles. (5) Glaciofacts are manifold as to shape and size. (6) Small polished splinters with regularly spherical shape (stone-rain according to J. Val'ter) are missing among the glaciofacts; they are formed by the rolling of small isometric pieces of hard rock by the wind. (7) Among glaciofacts there are no polyhedral pyramidal

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pebbles with 4 and 5 tapering facets. (8) Smooth and especially polished facets of small glaciofacts usually show fine lines, scratches, and grooves (Fig 1: 5-7 and 9) which are similar to scratches on wethers' foreheads. (9) The facets of glaciofacts have no "pock-marks" and punctures contrary to some Aeolian glyptoliths. (10) Glaciofacts are characterized by irregular petrographic composition. The composition of Aeolian glyptoliths is much more regular. There are 1 figure and 6 references, 4 of which are Soviet.

PRESENTED: March 7, 1959, by D. V. Nalivkin, Academician

SUBMITTED: February 25, 1959

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3(5)

007/00-100 10-11

AUTHOR: Karlov, N. N.

TITLE: On the Composition and Stratigraphic Role of the Romankovo Mammalian Fauna

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 128, Nr 1, pp 140 - 143 (USSR)

ABSTRACT: In the autumn of 1957 the author found together with stone numerous remains of Quaternary mammals as well as tools and flint-blades, tools of bones, staghorn, and teeth of Paleolithic sharks in the trench of the upper lock head of the lock of the Dneprodzerzhinskaya GSS under construction on the right bank of the Dnepr near Romankovo (west of Dnepropetrovsk approximately 35 km). Furthermore also remains of primitive man were found in 1958 and 1959 beside flints and animal remains. It is of greatest scientific interest since already the first finds indicate an age higher than Upper Paleolithic. The list of mammals (Table 1) the remains of which from the collections near Romankovo have hitherto been determined points to the following fact: On the one hand the fauna found here is to a certain extent related to the Quaternary fauna in the

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On the Composition and Stratigraphic Role of the  
Romankovo Mammalian Fauna

SOV/20-128-1 14.5-

region of the lower course of the Volga (nizovye Povolzh'ya) (Refs 1-3 and 6), on the other with the Quaternary fauna of the Mousterian site Staryy Kedak (V. I. Gromova, N. N. Karlov, I. G. Pidoplichko, Refs 2, 5 and 7) approximately 9 km. to the south of Dnepropetrovsk. The remains of mammals and man are deposited with tools in the washed-out Dnepr moraine, the rubble of which consists of eruptive, metamorphic, and sedimentary rocks. The archaeological age of the Romankovo site is assumed to be the end of Mousterian - beginning Aurignacian with distinctly marked Mousterian traditions. Thus the Romankovo-deer-mammoth-bison fauna is characterized as late Middle Riss glacial or earliest Riss glacial at the boundary between Middle and Upper Paleolithic. The author thanks V. V. Bazarov, N. A. Burchak-Abramovich, A. I. Godina, V. I. Gromova, and V. I. Svistun for helping in the determination of the fauna. There are 1 figure, 1 table, and 8 references, 7 of which are Soviet.

PRESENTED: April 28, 1959, by Dr. V. Nalivkin, Academician

SUBMITTED: November 29, 1958  
Card 2/2

KARLOV, N.N., kand.geologo-mineralogicheskikh nauk, (Dnepropetrovsk)

Age of the Cro-Magnon man. Priroda no.6:83 Jø '60.  
(MIRA 13:6)

(Man, Prehistoric)

KARLOV, N.N.

Quaternary dislocation in the vicinity of Dneprodzerzhinsk.  
Bul. Kom. chetv. per. no.24:90-92 '60. (MIRA 16:7)

(Dneprodzerzhinsk region--Folds(Geology))

KARLOV, N.N.; KRAVCHENKO, A.I.

Contribution of N.I. Dmitriev to the study of the geology  
of the Quaternary and the geomorphology of the Ukraine. Biul.  
Kom. chetv. per. no.24:138-144 '60. (MIRA 16:7)

(Ukraine—Geology)



KARLOV, N.N. (Dnepropetrovsk)

Plack laccolith in the Crimea. Priroda 49 no. 12:107 D '60.  
(MIRA 13:12)

(Crimea--Laccoliths)

KARLOV, N.N.

Continental bone breccia with windkaners on the southern slope of  
the Ukrainian crystalline shield. Dokl.AN SSSR 137 no.5:1185-1187  
Ap '61. (MIRA 14:4)

1. Predstavleno akademikom N.M.Strakhovym,  
(Bazavluk Valley---Breccia)

KARLOV, N.N.

Armored structural relief of the Pliocene desert in the Black  
Sea Depression. Dokl. AN SSSR 139 no.6:1428-1431 Ag '61.

(MIRA 14:8)

1. Predstavleno akademikom I.P. Gerasimovym.  
(Ingulets Valley—Geology, Stratigraphic)

KARLOV, N.N.

Recent data on geological dating and the relationship of some  
paleolithic industries in the Ukrainian S.S.R. Dokl. AN SSSR  
141 no.5:1183-1186 D '61. (MIFA 14:12)

1. Predstavleno akademikom N.M. Strakhovym.  
(Dnepropetrovsk Province--Stone age)

KARLOV, N.N.

Horizon with the occurrence of *Lentidium sokolovi* Karlov, sp.nova in  
the Black Sea trough. *Biul.MDIP Otd.geol.* 37 no.1:101-110 Ja-F '62.  
(MIRA 15:2)

(Black Sea region—Lamellibranchiata, Fossil)

KARLOV, N.N.

Antecedency of the Dnieper Valley above the rapids. Dokl. AN  
SSSR 142 no.5:1140-1142 F '62. (MIRA 15:2)

1. Predstavleno akademikom I.P.Gerasimovym.  
(Dnieper Valley—Geology)

KARLOV, N.N.

Structural relief and tectonics in the northern part of the  
region of the Sea of Azov. Dokl. AN SSSR 142 no.6:1362-  
1364 F '62. (MIFA 15:2)

1. Predstavleno akademikom I.P.Gerasimovym.  
(Azov Sea Region--Geology, Structural)

KARLOV, N.N.

A case of occurrence of the ancient Black Sea beach at a high elevation on the Berda River. Dokl. AN SSSR 143 no.1:179-180 Mr '62. (MIRA 15:2)

1. Predstavleno akademikom N.M.Strakhovym.  
(Rodionovka region (Zaporozh'ye Province—Geology)



KARLOV, N. N.; NOSOVSKIY, M. F.

Bentonite in Lower Sarmatian sediments of the Black Sea trough.  
Sov. geol. 5 no.10:126-131 0 '62. (MIRA 15:10)

1. Dnepropetrovskiy gosudarstvennyy universitet.

(Black Sea lowland--Bentonite)

KARLOV, N.N.

Oxford bioherms in the eastern part of the Crimea. Izv. vys.  
ucheb. zav.; geol. i razv. 6 no.4:41-46 Ap '63. (MIRA 16:6)

1. Dnepropetrovskiy gornorudnyy institut.  
(Crimea—Reefs)

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KARLOV, N.N.

Significance of V.A. Obruchev's works on the genesis of loess.  
Och. po ist. geol. znan. no.12:83-99 '63. (MIRA 16:10)

KARLOV, N.N.[Karlov, M.M.]

Boulder of polymictic sandstone from the coal layer h<sub>10</sub> in  
the Donets Basin. Geol. zhur. 23 no.2:91-93 '63.

(MIRA 16:6)

(Donets Basin—Boulders)

KARLOV, N.N.

Upper senoman oyster bed with *Griphaea vesicularis* Lam. in  
the Black Sea Depression. Dokl.AN SSSR 149 no.1:156-157 Mr  
'63. (MIRA 16:2)

1. Predstavleno akademikom D.V.Nalivkinym.  
(Black Sea region—Geology, Stratigraphic)

KARLOV, N.N.

Recent data on the conditions of deposition of sands of the Sivash series in the area of Dnepropetrovsk. Dokl. AN SSSR 151 no.1: 168-170 J1 '63. (MIRA 16:9)

1. Predstavleno akademikom N.M.Strakhovym.  
(Dnepropetrovsk region--Sand)

KARLOV, N.N.

Epycolastic material in the loess of Central Asia. Lit. i pol. iskop.  
no. 23293-297 '63. (MIRA 17 10)

1. Dnepropetrovskiy universitet i Nauchno-issledovatel'skiy institut  
geologii. Dnepropetrovsk.

KARLOV, N.N.

Halloysite from the sands of Poltava series, Zap.Vses.min.ob-va  
93 no.60723-724 '62. (MIRA 1844)



KARLOV, N.N. [Karlov, M.M.]

Age and rational designation of the so-called "Scythian clays" in  
the Ukraine. Dop. AN URSS no.6, 748-752 '65.

(MIRA 1837)

KARLOV, N.N.

Boundary between Paleogene and Neogene systems and the age of the  
Aquitania and Hatti stages. Sov. geol. 8 no.5: 115-119 My '65.  
(MIRA 18:7)

KARLOV, N.N.

Tectonic pattern of the Black Sea Depression. Dokl. AN SSSR 163  
no.5:1225-1226 Ag '65. (MIRA 18:3)

1. Submitted May 5, 1965.

L 27241-65 EWT(d)/EEC(k)-2/EEG-2/EWP (1) Pa-1/Po-1/Pq-1/Pg-1/Pk-1 TJP(c)  
 ACCESSION NR: AT5003917 BB/GG/GS/ S/0000/64/000/000/0209/0211

AUTHOR: Korolev, V. V.; Karlov, N. P.; Trebina, N. M.; Frolov, A. A.

50

TITLE: Analog equipment for the processing of experimental curves

37

8-1

SOURCE: Vsesoyuznaya konferentsiya - seminar po teorii i metodam matematicheskogo modelirovaniya. 3d, 1962. Vychislitel'naya tekhnika v upravlenii (Computer technology in control engineering); sbornik trudov konferentsii. Moscow, Izd-vo Naukz, 1964, 209-211

TOPIC TAGS: data processing, data reduction, automatic data correlation, automatic integration, automatic Fourier analysis

166

ABSTRACT: A combined analog computer intended for the calculation of the mean values of measured quantities and determining the frequency spectrum of an experimental curve, such as may be obtained in heat-physics research, and whose construction is within the capability of a small laboratory, is described. The equipment is based on the use of dc amplifiers with automatic null drift stabilization, and precision wire-wound resistances. Curves traced by an automatic recording

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KARLOV, N. V.

PA 240T76

USSR/Electronics - Nonlinear Detector Dec 52

"Investigations of Dependence of a Nonlinear Crystalline Detector on Small Shifts of the Contact Needle," N. V. Karlov and A. Ye. Salomonovich

"Zhur Tekh Fiziki" Vol 22, No 12, pp 1981-1984

Investigate variation of detector behavior at shifts of order of  $10^{-4}$  cm. Use for measurements dynamic method applied previously (DAN, 70, 4, 1950). Results show that nonlinear properties of detector depend on variation of gap size in similar manner as in case of gap between metals. Received 25 Jul 52.

240T76

KARLOV, N. V.

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621.317.794 : 621.398.822 221  
The Sensitivity of Radiometers. — E. V. Bunkin &  
N. V. Karlov. (Zh. tekhn. fiz., March & April 1955, Vol. 25,  
Nos. 3 & 4, pp. 430-435 & 733-741.) A precise definition PH  
of the sensitivity of a radiometer is given and the value  
is calculated for a compensation-type radiometer, taking  
into account the fluctuation of the amplification factor at  
high frequency. Similar calculations are carried out for a  
radiometer of the modulation type. In both cases  
particular attention is given to the effect of the width  
of the band received.

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*KARLOV, N. V.*

Category : USSR/Radiophysics - Application of radiophysical methods

I-12

Abs Jour : Ref Zhur - Fizika, No 1, 1957 No 1972

Author : Bunkin, F.V., Karlov, N.V.

Title : Sensitivity of a Modulation Radiometer in the Presence of Stationary  
Fluctuation of the Amplification Coefficient.

Orig Pub : Tr. 5-go soveshchaniya po vopr. kosmogonii. 1955, M., AN SSSR, 1956, 81-87

Abstract : See Referat. Zhur. Fiz., 1956, 4747 and 4748

Card : 1/1

*KARLOV, N. V.*

I-12

Category : USSR/Radiophysics - Application of Radiophysical Methods

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1973  
Inst : Radio Physics Faculty, Leningrad State University

Author : Karlov, N.V.

Title : On the Sensitivity of a Null Radiometer

Orig Pub : Tr. 5-go soveshchaniya po vopr. kosmogonii. 1955, M., AN SSSR, 1956, 88-93,  
diskus. 93-95

Abstract : Development of the theory of the sensitivity of an automatic null radio-meter, treated as a servomechanism system. The differential equation describing the noise in the radiometer with the feedback loop closed are solved under the assumption that it is possible to neglect the small relative fluctuations of the noise temperature of the regulated equivalent. It is shown that if the regulation coefficient is chosen large enough, the effect of the fluctuations of the amplification coefficient can be made as small as desired. In this approximation, the sensitivity threshold of the null radiometer does not differ from the natural sensitivity threshold of the corresponding modulation radiometer. In the discussions following the paper, A.P. Molchanov made a brief report on investigation of an improved compensation method for the reception of small signals, made at the Radio Physics Faculty of the Leningrad State University.

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KARLOV, N.V.; SALOMONOVICH, A.Ye.

Application of ferrites in radioastronomy technique. Radiotekh. i elektron. 1 no.1:120-121 Ja '56. (MLRA 9:11)

1. Fizicheskiy institut imeni P.N. Lebedeva Akademii nauk SSSR.  
(Radio astronomy) (Ferrite(Steel constituent))

KARLOV, N.V.; SALOMONOVICH, A.Ye.

Automatic null-type centimeter-wave radiometer for investigation  
of weak noise signals. Radiotekh. i elektron. 1 no.1:121-122 Ja '56.  
(MLRA (9:11))

1. Fizicheskiy institut imeni P.N. Lebedeva Akademii nauk SSSR.  
(Radiometer) (Radio astronomy)

KARLOV, N.V.

Application of Radiophysical Methods.

I-9

USSR APPROVED FOR RELEASE: 06/13/2000

CIA-RDP86-00513R000720730001-1"

Abs Jour : Ref Zhur - Fizika, No 5, 1957, No 12618  
Author : Karlov, N.V.  
Inst : Physics Institute imeni P.N. Lebedev, Academy of Sciences,  
USSR  
Title : Concerning Parasitic Modulation.  
Orig Pub : Radiotekhn. i elektronika, 1956, 1, No 6, 852-860  
Abstract : If there is a mismatch between the input of the receiver  
and the antenna channels, there appears at the output of  
a modulation radio meter a parasitic signal, which redu-  
ces the sensitivity of the radio meter and reduces the ac-  
curacy of the absolute measurements. The magnitude of  
the parasitic signal is determined by the reflection and

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56. N. V. KARLOV, A. E. SALOMONOVICH; Automatic null radiometer at 3.2 cm  
(FIAN USSR) P. 886

Abstract: The development is described of an automatic null radiometer of the centimeter band intended to investigate weak noise signals. A horn antenna directed toward the zenith with a partially absorbing attenuator submerged in the waveguide, at the input is used as the controlled noise source which has an effective temperature below room temperature. Parasitic modulation was eliminated by using a ferrite rectifier. The attenuator was set on the output of the shaft of the reversing motor, which is the output of an EPP-09 potentiometer with the error signal at its input. The radiometer was tested in the 10-200° antenna temperature band with  $10^{-3}$  regulation coefficients.

RADIOTEKHNIKA I ELEKTRONIKA, Vol 1, nr 6, 1956, p 886

KARLOV, N.V.; SALOMONOVICH, A.Ye.

Automatic zero radiometer used for measurements at 3,2 cm.wavelengths.  
Prib.i tekhn.eksp.no.2:105-108 S-O '56. (MLRA 10:2)

1. Fizicheskiy institut im.P.N.Lebedeva AN SSSR.  
(Radiometer)

KARLOV, N. V., CHIKHACHEV, B. M. (FIAN, Moscow)

"The Sensitivity of Radiometers in the Quantum Range".

report presented at the All-Union Conference on Statistical Radio Physics,  
Gor'kiy, 13-18 October 1958. (Izv. vyssh uchev zaved-Radiotekhn., vol. 2,  
No. 1, pp 121-127) COMPLETE card under SIFOROV, V. I.)

*1/10/80 NV*

109-1-8/18

AUTHOR: Karlov, N.V.

TITLE: Sensitivity of the Radiometer fitted with an Automatic Gain Control (AGC) (Chuvstvitel'nost' radiometra s ARU)

PERIODICAL: Radiotekhnika i Elektronika, 1954, Vol.III, Nr 1, pp.74-79 (USSR)

ABSTRACT: One of the shortcomings of the standard type of the radiometer is the fluctuation of its amplification, which leads to a decrease of its threshold sensitivity (Ref.1). It appears, however, that the effect of the gain fluctuation can be reduced in a modulation-type radiometer by employing a suitable AGC system. The paper is concerned with the analysis of such a system. It is assumed that, with the feedback loop open, the amplification of the system is expressed by:

$$A(t) = A_0 [1 + \alpha(t)] \quad , \quad (1)$$

where  $A_0$  is the average gain and  $\alpha(t)$  is the time fluctuation. If the feedback loop is closed, the gain can be expressed by:

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109-1-2/18

Sensitivity of a Radiometer Fitted with an Automatic Gain Control (AGC)

$$A(t) = A_0 [1 + \alpha(t) - \mu \varepsilon(t)] \quad , \quad (2)$$

$$\text{where } \mu \text{ is a coefficient, and } \varepsilon(t) = E(t) - E_0 \quad (3)$$

is the error signal where  $E_0$  is a certain fixed voltage and  $E(t)$  is the voltage at the output of the filter in the AGC network, which can be expressed by means of the Duhamel integral (Eq.(4)) in terms of the noise voltage at the output of the detector,  $V(t)$ . The impulse response of the AGC filter is given by  $h(t)$ . It is shown that if a square detector of the type  $V(t) = Au^2(t)$  is employed and the AGC network is an integrating RC element, the error function can be found from Eq.(6) in which  $\tau_0 = RC$  and  $K = \mu A_0 \bar{u}^2$  where  $u(t)$  is the noise at the input to the receiver. Solution of Eq.(6) is in the form shown in Eq.(7) which can be used to evaluate the gain of a closed loop system. It is found that the gain can be expressed by Eq.(10), in which  $T_B$ ,  $T_s$  and  $T_a$  are the temperatures of the inner noise, of the noise equivalent and of the

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10)-1-5/18

Sensitivity of a Radiometer fitted with an Automatic Gain Control (AGC)

antenna, while  $\Delta T = T_a - T_3$ . An expression for the threshold sensitivity of the system is derived and this is in the form of Eq.(15) in which  $\Omega$  is the modulation frequency,  $\Delta\Omega = \pi/2\tau$  is the effective bandwidth of the output meter and  $\varphi(t)$  represents the fluctuation of the noise figure. From the analysis of Eq.(16) it is concluded that, provided the modulation type radiometer is furnished with a high frequency amplifier, the application of AGC can lead to a decrease in the threshold sensitivity of the system. Application of the AGC is particularly advantageous when  $\Delta T < 0.5(T_B + T_3)$ . On the other hand, in a radiometer without the high frequency amplifier, the noise figure is determined by the effective temperature of the mixer noise and in this case it is difficult to say if AGC leads to any improvements. The author thanks F. V. Bunkin and A. E. Salomonevich for discussion and valuable advice. There are

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100-1-0/13

Sensitivity of a Radiometer fitted with an Automatic Gain Control (AGC)

6 references, 3 English and 3 Russian.

ASSOCIATION: Physics Institute im. P.N. Lebedev of the Academy of Sciences, USSR (Fizicheskiy institut im. P.N. Lebedeva AN SSSR)

SUBMITTED: June 20, 1956

AVAILABLE: Library of Congress

Card 4/4

AUTHORS: Karlov, N.V. and Chikhachev, B.M. SOV/109-4-6-19/27  
 TITLE: Sensitivity of a Low-noise Radiometer (in the Quantum Region) (O chuvstvitel'nosti radiometra s malym urovnem sobstvennykh shumov (v kvantovoy oblasti))  
 PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 6, pp 1047 - 1051 (USSR)  
 ABSTRACT: The intensity of the noise spectrum of a resistance maintained at a temperature T is given by :

$$g(\omega) = \frac{\hbar\omega}{2} + \frac{\hbar\omega}{\exp\frac{\hbar\omega}{kT} - 1} = \frac{\hbar\omega}{2} \coth \frac{\hbar\omega}{2kT} \quad (2)$$

where  $\hbar$  is the Planck constant and  
 k is the Boltzman constant.

This formula is more complicated than the standard Nyquist equation but it is essential at low temperatures and at high frequencies. From Eq (2), it is seen that

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SOV/109-4-6-19/27

Sensitivity of a Low-noise Radiometer (in the Quantum Region)

the quantum effects become important when  $\hbar\omega \approx kT$ . The problem consists of determining the lowest "perceptible" change in the equivalent temperature of the input noise of a compensation-type radiometer. It is assumed that the input noise is given by Eq (2) and that the amplifier of the radiometer has a power transfer function  $A(\omega)$ . The noise spectrum at the output amplifier is therefore given by Eq (6). If the amplifier is followed by a square detector, the DC component of the output current is defined by Eq (7). If the bandwidth of the radiometer  $\Delta\omega$  is a small fraction of the central frequency  $\omega_0$ , the output current can be expressed by Eq (8). The average square fluctuation of the noise at the output of the detector is given by Eq (11) or, finally, by Eq (12), where  $\Delta\Omega = \pi/2RC$ . The symbols  $R$  and  $C$  represent the resistance and the capacitance of the detector output. The minimum discernible equivalent noise temperature  $\delta T$  can be evaluated from Eq (13). The solution of that is in the form:

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SOV/109-4-6-19/27

Sensitivity of a Low-noise Radiometer (in the Quantum Region)

$$\delta T = \frac{\hbar\omega_0}{k} \frac{1}{\ln \left[ 1 + \frac{2}{(1+q) \coth \frac{\hbar\omega_0}{kT} - 1} \right]} - T \quad (15).$$

This expression differs substantially from the well-known (F.V. Bunkin, N.V. Karlov - Ref 1) equation:

$$\delta T = qT \quad (16).$$

Thus, it is found that at  $\hbar\omega_0 \approx kT$ , the sensitivity obtained by Eq (15) is only 20% of that evaluated by Eq (16). The dependence of the sensitivities evaluated from Eqs (15) and (16) on  $\hbar\omega_0/kT$  for various values of  $q$  is illustrated in Figure 1. The graphs of Figure 2 illustrate the sensitivity  $\delta T$  as a function

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Sensitivity of a Low-noise Radiometer (in the Quantum Region) SOV/109-4-6-19/27

of the noise temperature  $T$ . The authors make acknowledgment to F.V. Bunkin for the discussion of the problems considered in this work. There are 2 figures and 4 references, of which 2 are English and 2 Soviet.

ASSOCIATION: Fizicheskiy institut im. P.N. Lebedeva AN SSSR  
(Physics Institute imeni P.N. Lebedev of the Ac.Sc., USSR)

SUBMITTED: February 5, 1958

Card 4/4

AUTHORS: Karlov, N.V. and Chikhachev, B.M.

SOV/109-4-6-20/27

TITLE: Sensitivity of a Radiotelescope at Low Input-noise Levels  
(O chuvstvitel'nosti radioteleskopa pri malykh urovnyakh  
vkhodnykh shumov)

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 6,  
pp 1052 - 1056 (USSR)

ABSTRACT: The formulae obtained by the authors in the preceding paper (pp 1047-1051) of this journal permit the determination of the sensitivity of a radiometer in terms of the effective temperature of the antenna and the relating of this quantity to the sensitivity pertaining to the brightness temperature of a celestial object. It is therefore possible to determine the sensitivity of a radiotelescope at small input-noise levels. A radiotelescope is subject to the antenna noise and the noise of its amplifier. The noise spectrum at the input is expressed by:

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$$g(\omega, T) + g(\omega, 0) = g(\omega, T_B) + g(\omega, T_a) \quad (1)$$

SOV/109-4-5-20/27

Sensitivity of a Radiotelescope at Low Input-noise Levels

where:  $g(\omega)$  is given by the accurate Nyquist formula, and  $T_B$  and  $T_a$  represent the effective temperatures of the internal noise of the radio-telescope and the antenna, respectively.

An increase in the antenna temperature  $\delta T_a$  results in an increase  $\delta T$  of the input temperature; these quantities are related by Eq (2). Eqs (1) and (2) can be written as Eqs (3). From these it is possible to determine the minimum perceptible  $\delta T_a$  if the sensitivity  $\delta T$  is known. The latter is given by Eq (4) (see the preceding paper). The minimum  $\delta T_a$  is therefore given by:

$$\delta T_a = \frac{\hbar\omega}{k} \frac{1}{\ln \left[ 1 + \frac{2}{q \coth \hbar\omega/2kT_B + (q+1) \coth \hbar\omega/2kT_a - (q+1)} \right]} - T_a \quad (5).$$

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Sensitivity of a Radiotelescope at Low Input-noise Levels SOV/109-4-6-20/27

It is seen that the expression differs considerably from the standard expression for the sensitivity which is given by Eq (6). Figure 1 shows the dependence of the ratio of the sensitivity, as evaluated by Eqs (5) and (6), on the parameter  $\hbar\omega/k(T_B + T_a)$ . Figure 2, constructed by employing Eq (5), shows the dependence of the sensitivity  $\delta T_a$  on the temperatures  $T_B + T_a$ . The radiation energy per 1 sec received from the direction defined by  $\varphi$  and  $\theta$  over a spherical angle  $d\Omega$  is defined by Eq (9), where  $T_A(\varphi, \theta)$  is the brightness temperature of the source. Now, an antenna having an effective area  $A(\varphi, \theta)$  produces an energy (per unit bandwidth) which is defined by Eq (10). If the directivity of the antenna is defined by:

$$G(\varphi, \theta) = \frac{\omega^2}{\pi c^2} A(\varphi, \theta) ,$$

Card3/5 an expression in the form of Eq (11) is obtained.



Sensitivity of a Radiotelescope at Low Input-noise Levels SOV/109-4-6-20/27

On the basis of Eqs (5) and (11), it is possible to determine the sensitivity of the radiotelescope with regard to the temperature of the source, provided the directional pattern of the antenna is known. If the spherical angle  $\Sigma_A$  of the source is small, so that  $G(\varphi, \theta)$  is a constant quantity within this angle, Eq (11) can be written as Eq (14). The sensitivity of the radiotelescope  $\delta T_i$ , which corresponds to the lowest perceptible  $\delta T_a$ , is therefore given by Eq (16). The authors express their gratitude to F.V. Bunkin for the discussion of the investigated problems. There are 2 figures and 3 Soviet references.

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SOV/109-4-6-20/27

Sensitivity of a Radiotelescope at Low Input-noise Levels

ASSOCIATION: Fizicheskiy institut im. P.N. Lebedeva AN SSSR  
(Physics Institute imeni P.N. Lebedev of the Ac.Sc.,  
USSR)

SUBMITTED: April 28, 1958

Card 5/5

59904

S/109/60/005/04/019/028  
E140/E435

9.4000

AUTHORS: Basov, N.G. and Karlov, N.V.  
TITLE: Brief Communication on a Wideband Radiometer with  
Quantum Spectrum Converter  
PERIODICAL: Radiotekhnika i elektronika, 1960, Vol 5, Nr 4,  
pp 676-677 (USSR)  
ABSTRACT: The use of a molecular system with three discrete  
energy levels is proposed for converting a wideband  
radiation to monochromatic oscillation. This system  
may be used to receive signals at higher frequencies  
than the auxiliary oscillation. A.Ye.Salemonovich  
participated in discussion of the work. There are  
2 figures.  
ASSOCIATION: Fizicheskiy institut im. P.N.Lebedeva AN SSSR  
(Physics Institute imena P.N.Lebedev, AS USSR)  
SUBMITTED: December 23, 1958  
Card 1/1

ZINGER, Dzh.[Singer, J.R.], prof.; ZUYEV, V.S.[translator]; KARLOV, N.V.,  
[translator]; SHMAONOV, T.A. [translator]; BUNKIN, F.V., red.  
POPOV, R.Yu., red.; GRIBOVA, M.P., tekhn. red.

[Masers; solid state generators and amplifiers] Mazery; kvanto-  
vye usiliteli i generatory. Pod red.F.V.Bunkina, Moskva, Izd-vo  
inostr. lit-ry, 1961. 206 p. (MIRA 15:1)  
(Masers)



21656

S/109/61/006/003/011/018

E140/E135

### Saturation and Recovery Time of Paramagnetic Amplifiers

lines correspond to the travelling-wave case, the solid line to the resonator case. Improvements in relaxation time may be obtained by increasing the operating temperature, which it is claimed has other beneficial effects, such as increase in the energy density of the pumping field and increase in magnetic quality. A second possibility is the addition of paramagnetic impurities which should reduce the "vacant" transition 2 - 3. Certain other advantages of this procedure have been considered in the literature (H.E.D. Scovil and G. Feher, Phys.Rev., 1957, 105, 762, Ref.5; and E.O. Schulz-Du Bois, H.E.D. Scovil and R.W. De Grasse, Bell System Techn. J., 1959, 38, 335, Ref.6). Analysis shows that reduction of the relaxation time by increasing only a single relaxation probability permits obtaining the maximum number of active molecules, and with lower pumping field radiation, to improve the amplitude and relaxation characteristics of the paramagnetic amplifier. There are 2 figures and 6 references: 2 Soviet and 4 English.

Card 2/3

21656

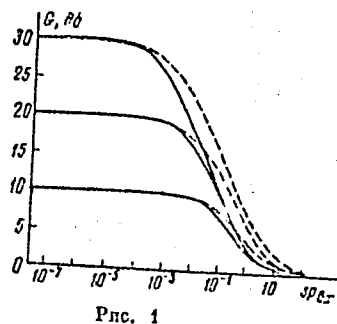
Saturation and Recovery Time ....

S/109/61/006/003/011/018  
E140/E135

ASSOCIATION: Fizicheskiy institut im. P.N. Lebedeva AN SSSR  
(Physics Institute imeni P.N. Lebedev, AS USSR)

SUBMITTED: April 7, 1960

Fig. 1



Card 3/3

9.2570 (also 2503, 2603, 2903)

21657

S/109/61/006/003/012/018  
E140/E135

AUTHORS: Karlov, N.V., Pimenov, Yu.P., and Prokhorov, A.M.

TITLE: The Sensitivity of Radio Receivers With Paramagnetic Amplifiers

PERIODICAL: Radiotekhnika i elektronika, 1961, Vol.6, No.3, pp. 416-421

TEXT: In view of the low intrinsic noise of paramagnetic amplifiers it is useful to examine the possible gain in sensitivity for equipment employing them. Here distinction must be made between the reception of regular, practically monochromatic signals, and the reception of noise signals. The present calculations take this distinction into account. For the case of regular signal reception the use of the paramagnetic amplifier sharply improves the sensitivity, for specific numerical values considered by the author, up to factors of 40-80. In the case of noise receivers it is found that resonator type paramagnetic amplifiers are useful if the gain bandwidth factor is not less than that of the radiometer in the absence of the paramagnetic amplifier. At the same time resonator type paramagnetic amplifiers  
Card 1/2



21657

S/109/61/006/003/01<sup>2</sup>/018  
E140/E135

The Sensitivity of Radio Receivers With Paramagnetic Amplifiers with gain above 20 dB do not operate sufficiently stably. The travelling-wave type paramagnetic amplifier, not as effective at gains equal to 10 dB, gives theoretically better results above 20 dB, but also exhibits instabilities at the higher gain. There are 2 figures and 4 references: 3 Soviet and 1 English. ✓

ASSOCIATION: Fizicheskiy institut im. P.N. Lebedeva AN SSSR  
(Physics Institute imeni P.N. Lebedev, AS USSR)

SUBMITTED: April 7, 1960

Card 2/2

9.2572

S/109/61/006/005/025/027  
D201/D303

AUTHORS: Karlov, N.V., Pimenov, Yu.P., and Prokhorov, A.M.

TITLE: A 10 cm frequency band paramagnetic amplifier utilizing  $\text{Fe}^{3+}$  ions in corundum

PERIODICAL: Radiotekhnika i elektronika, v. 6, no. 5, 1961, 846

TEXT: It has been recently shown by experiment that the  $\text{Fe}^{3+}$  ions in corundum can be utilized in paramagnetic amplifiers in the 3 cm band of frequencies (Ref. 1: L.S. Kornivenko, A.M. Prokhorov, ZhETF, 1959, 36, 919) and (Ref. 2: J.E. King, K.W. Tarnune, J. Appl. Phys. 1959, 30, 1844). It would be of interest to show that this material could be used for building a PNY (RPU) in the 10 cm frequency band. For this application several levels of the  $\text{Fe}^{3+}$  ion could be used. The authors studied experimentally one level only, for which they used the resonant system of the paramagnetic amplifier already in hand. The trigonal axis of the crystallic

Card 1/3

22278

S/109/61/006/005/025/027  
D201/D303

A 10 cm frequency band ...

electric field was perpendicular to the external magnetic field. In this case the energy levels of two non-equivalent systems of  $\text{Fe}^{3+}$  ions coincide. The transition between lower levels was used for amplification. These levels for parallel orientation could be characterized by quantum numbers  $M = \pm 1/2$ . As the subsidiary transition  $-1/2 \longleftrightarrow -3/2$  was used. The frequency of the subsidiary radiation was  $\sim 14,000$  mc/s. In the resonator used the high frequency magnetic field of the signal was perpendicular to the external magnetic field and to the trigonal axis of the crystal. Amplification and generation was observed at  $2^\circ\text{K}$ . The magnitude of the constant magnetic field was about 380 oersted. The small value of the gain-band width product in this case was mainly due to the fact that the sample of the corundum in hand had too small a number of iron ions. It could be inferred from these preliminary experiments that, as it seems, corundum with  $\text{Fe}^{3+}$  is a material suitable for making a paramagnetic amplifier in the decimetric frequency band. There are 2 references: 1 Soviet-bloc and 1 non-Soviet

Card 2/3

A 10 cm frequency band ...

S/109/61/006/005/025/027  
D201/D303

bloc. The reference to the English-language publication reads as follows: J.E. King, R.W. Terhune, J. Appl. Physics, 1959, 30, 1844. [Abstractor's note: This is essentially a complete translation].

SUBMITTED: September 26, 1960

X

Card 3/3

24474

S/109/61/006/006/015/016  
D204/D303

9.2590

AUTHOR: Karlov, N.V.

TITLE: The problem of investigating delay systems

PERIODICAL: Radiotekhnika i elektronika, v. 6, no. 6, 1961, 1029

TEXT: In this short communication the author suggests that the direct method of determining the amount of increase in the density of high frequency energy in an analyzed system would be the use of the free radical  $\alpha$  -  $\alpha$  - diphenyl -  $\beta$  -  $\beta$  - picryl - hydrazyl (A $\phi$  (DPH) (DFPG). It is evident that the ratio of the magnitudes of lines of electron paramagnetic resonance (ЭПР) (EPR) of the same sample of DPH placed either in the delay system or in the feeder, will be determined by the ratio of corresponding densities of the high frequency magnetic energy. In case when in both the feeder and in the delay system the HF magnetic field have the same distribution, the ratio of magnitudes of lines of the paramagnetic resonance would determine the ratio of group velocities directly. In this

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2447L

The problem of investigating ...

S/109/61/006/006/015/016  
D204/D303

case. with quadratic detection, the magnitude of resonance lines will be proportional to the corresponding group velocity. The knowledge of the magnetic field distribution can help in determining the distribution of electric fields. The use of DPPH can also help to determine the configuration of magnetic fields. When DPPH is being magnetized the existing free electron undergoes precession in a plane perpendicular to the magnetic field. Because of this, the line intensity of electron paramagnetic resonance is determined by the magnitude of an HF circularly polarized magnetic field component in this plane. This permits, by varying the orientation and polarity of the magnetic field, complete analysis of the polarity of the HF magnetic fields of the system. It should be noted that a direct determination of configuration and distribution of HF electric fields in the analyzed system can be achieved in a similar manner, using the cyclotron resonance in semi-conductors. The above method has been applied to analyze a slug-type delay system as described in E.G. Soloviyev, and Ye.K. Karlov (Ref. 4: Radiotekhnika i elektronika, 1961, 6. 3. 406). It has been found that in such sys-

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24474

S/109/61/006/006/015/016  
D204/D303

The problem of investigating ...

toms the group velocity is considerably decreased. The magnetic fields are concentrated basically at the base of the slugs in the planes perpendicular to them. Their polarization is very nearly circular. The author acknowledges the help of A.M. Prokhorov. There are 4 references: 3 Soviet-bloc and 1 non-Soviet-bloc.

ASSOCIATION: Fizicheskii Institut im. P.N. Lebedeva AN SSSR (Institute of Physics im. P.N. Lebedev, AS USSR)

SUBMITTED: September 21, 1960

X

Card 3/3

S/109/62/007/002/016/024  
D256/D303

AUTHORS: Karlov, N.V., and Prokhorov, A.M.

TITLE: Sensitivity of quantum receivers of electromagnetic radiation

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 2, 1962.  
328 - 331

TEXT: The following properties of quantum amplifiers and counters are discussed: 1) The set noise of the devices according to the received frequency range for monochromatic as well as continuous radiation; 2) The role of the external thermal radiation. Here the spectral density of the noise at the input and the resulting power of the noise at the output are considered in dependence upon the pass-band of the amplifier, and expression for the minimum detectable spectrum density are given for continuous as well as monochromatic radiations. It is pointed out that mono-chromatic radiation detection became important in connection with the recent developments of quantum light-generators; 3) A quantum amplifier is compared  
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Sensitivity of quantum receivers ...

S/109/62/007/002/016/024  
D256/D303

red with a bolometer showing that for monochromatic radiation the sensitivity of the quantum amplifier may exceed that of the bolometer in the case of a very low background; 4) The optical and infrared region amplifiers are considered. The method proposed by J. Weber (Ref. 3: Phys. Rev., 1957, 108, 3, 537) for the infrared region is discussed followed by a consideration of paramagnetic crystals for use as quantum counters; 5) Expressions are presented for the minimum number of signal photons detectable with a counter in the presence of background, as well as the corresponding spectral densities, for both thermal radiation and monochromatic signal detection. The sensitivity of the counters is shown to be higher than that of the amplifiers; 6) The derivation of the counter sensitivity is presented in the Appendix; the fluctuations of the instantaneous intensity of light are taken into account. There are 6 references: 2 Soviet-bloc and 4 non-Soviet-bloc. The references to the English-language publications read as follows: J.A. Giordmaine et al., Proc. I.R.E., 1959, 47, 6, 1062; L. Mandel, Proc. Phys. Soc., 1958, 72, 468, pt. 6, 1037; J. Weber, Phys. Rev., 1957, 108, 3, 537. ASSOCIATION: Fizicheskii institut im. P.N. Lebedeva AN SSSR (Institute of Physics im. Lebedev, AS USSR)

SUBMITTED: June 21, 1961

Chart 2, 3

S/053/62/077/001/001/003  
B117/B112

AUTHORS: Zverev, G. M., Karlov, N. V., Korniyenko, L. S.,  
Manenkov, A. A., Prokhorov, A. M.

TITLE: Application of paramagnetic crystals in quantum electronics

PERIODICAL: Uspekhi fizicheskikh nauk, v. 77, no. 1, 1962, 61 - 108

TEXT: Western and Soviet studies during the period 1952 - 1962 concerning the progress in the application of paramagnetic crystals for building quantum devices are reviewed. In these devices, which are used in the fields of radio and optics, negative temperatures are produced by auxiliary radiation. The following problems are discussed: energy levels of paramagnetic ions in crystals; relaxation phenomena in paramagnetic crystals; (paramagnetic) quantum amplifiers of the radio range (paramagnetic resonance amplifier РМЯ (RPU), paramagnetic progressive wave amplifier РВВВ (PUBV)); quantum generators and amplifiers of the optical range (optical quantum generators with ruby and fluorite, quantum amplifiers, quantum counters). Finally, the great progress achieved in quantum electronics during the short time of its existence is pointed out: ✓

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Application of paramagnetic...

S/053/62/077/001/001/003  
B117/B112

establishment of highly accurate frequency standards for various purposes; development of low-noise paramagnetic amplifiers of the radio range and of optical generators having a high degree of coherence and high spectral radiation density. The quick progress of quantum electronics and its promising prospects, are the consequence of its development on the basis of already existing technology. Progress was first achieved in the radio range, and later in the optical range. At present work is in progress in developing the entire range, including the submillimeter- and distant infrared range. There are 27 figures and 134 references: 45 Soviet-bloc and 99 non-Soviet-bloc. The four most important English-language references are: J. R. Singer and S. Wang, Second International Conference on Quantum Electronics, Berkeley, 1961; W. G. Wagner and G. Birnbaum, Second International Conference on Quantum Electronics, Berkeley, 1961; R. W. Hellwarth, Phys. Rev. Lett., v. 6, 19 (1961); A. L. Schawlow, G. E. Devlin, Phys. Rev. Lett., v. 6, 96 (1961).

Card 2/2

AIN Nr. 990-9 14 June  
*KARLOV, N.V.*  
TW MASER FOR AMPLIFICATION IN THE 3-cm BAND (USSR)

Karlova, Ye. K., N. V. Karlov, A. M. Prokhorov, and Ye. G. Solov'yev.  
Priory i tekhnika eksperimenta, no. 2, Mar-Apr 1963, 107-110.

S/120/63/000/002/025/041

Performance and construction details are described for a 3-cm traveling-wave maser which used a waveguide section containing two ruby rods attached along the base of a comb delay array on opposite sides of the teeth. The ruby had a  $\text{Cr}^{3+}$  concentration of about 0.07% and was 2 mm in diameter by 100 mm long; the red (isolating) ruby rod had a  $\text{Cr}^{3+}$  concentration of 1 to 2%. The external hf magnetic field was elliptically polarized in the plane of the comb, with its major axis normal to the traveling-wave line of propagation, in such a manner that at an eccentricity of 1.5 the energy density of the forward wave on one side of the comb array exceeded backward-wave density by 25 times. Measurement of energy density in the delay section was achieved by comparison of the EPR absorption line intensity in a DPPH sample, when the latter was located alternately in the feed-in and delay sections of the waveguide. The amplifier was

Card 1/2

AID Nr. 990-9 14 June

TW MASER FOR AMPLIFICATION [Cont'd]

S/120/63/000/002/025/041

operated in a nitrogen-free He cryostat, type KP-09, which included magnetic shim disks to achieve a uniformity of external field of  $\pm 1$  gauss over the 100-mm working length. Amplifier performance, with a pumping wavelength of 1.2 cm and external field of 4300 gauss showed 10 db of clean gain at 4.2°K He temperature, and 21 db at 1.8°K. The bandwidth exceeded 20 Mc. Critical dimensions and alignments of the maser elements are discussed. Photographs of the delay element as well as the overall enclosed system are included. [SH]

Card 2/2

KARLOV, N.V.; PROKHOROV, A.M.

Multicavity quantum amplifiers. Radiotekh. i elektron. 8  
no.3:453-456 Mr '63. (MIRA 16:3)

1. Fizicheskiy institut im. P.N.Lebedeva AN SSSR.  
(Masers) (Amplifiers (Electronics))

DANILYCHEV, V.A.; KARLOV, N.V.; OSIPOV, B.D.; SHIRKOV, A.V.; SHLIPPE, G.I.

Magnetic resistance used in field measurements at helium temperatures. Prib. i tekhn. eksp. 8 no.5:221 S-O '63. (MIRA 16:12)

1. Fizivheskiy institut AN SSSR.

AID Nr. 984-6

6 June

EPR SPECTRUM AND SPIN-LATTICE RELAXATION OF  $\text{Cr}^{3+}$  AND  $\text{Fe}^{3+}$  IONS IN  $\text{ZnWO}_4$  SINGLE CRYSTALS (USSR)

Vemel'yanova, Ye. N., N. V. Karlov, A. A. Manenkov, V. A. Milyayev, A. M. Prokhorov, S. P. Smirnov, and A. V. Shirokov. Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 44, no. 3, Mar 1963, 868-869.  
S/056/63/044/003/016/053

The EPR of  $\text{Cr}^{3+}$  and  $\text{Fe}^{3+}$  ions in  $\text{ZnWO}_4$  single crystals in equal concentrations of 0.1% has been studied in the 1.6 to 300°K range at frequencies from 9.4 to 15 Gc. Constants of the spin Hamiltonian describing the  $\text{Cr}^{3+}$

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AID Nr. 984-6 6 June

## EPR SPECTRUM AND SPIN-LATTICE (Cont.)

8/056/63/044/003/016/053

spectrum were obtained, and the spin-lattice relaxation time ( $T_1$ ) of the  $\text{Cr}^{3+}$  ion was determined by the pulse saturation method at a frequency of 9.4 Gc for the transition  $M = +1/2 \leftrightarrow -1/2$ . The relaxation time of the  $\text{Cr}^{3+}$  ion was 1.1 msec at 4.2°K and 5.3 msec at 1.6°K, satisfying the relationship  $T_1 = 1.15(\exp(\delta/kT) - 1) \cdot 10^{-3}$  sec, with the parameter  $\delta/k$  equalling 2.8°K. This relationship is explained as due to direct resonance processes under the assumptions that transition between lower levels  $M = \pm 1/2$  is forbidden and that the relaxation is accomplished through the upper level  $M = 3/2$  located at a distance  $\delta$  from  $M = 1/2$ . The spin-lattice relaxation time of the  $\text{Fe}^{3+}$  ions obtained by the same method was 75  $\mu$ sec at 4.2°K and 180  $\mu$ sec at 1.6°K, satisfying the relationship  $T_1 \sim 1/T$  within this temperature range. Crystals containing only  $\text{Fe}^{3+}$  ions (in a concentration of  $\sim 0.3\%$ ) had a relaxation time of  $85 \pm 5$   $\mu$ sec at 1.6°K and were shown to contain two nonequivalent groups of ions. Crystals containing both  $\text{Fe}^{3+}$  and  $\text{Cr}^{3+}$  ions did not show the presence of two  $\text{Fe}^{3+}$  ion systems.

[BB]

Card 2/2

KARLOV, N. V.

"On the ultimate sensitivity limit of the electromagnetic radiation receivers."

report presented at the Intl Conf on Microwaves Circuit Theory & Information Theory, Tokyo, 7-11 Sep 64.

P.N. Lebedev Physics Inst, Moscow.

L 20375-65 EWP(1)/EWT(m)/EHC(t)/EWP(t)/EWP(b) Feb IJP(c)/AFWL/  
 ASD(a)-5/SSD/AS(mp)-2/RAEM(c)/RAEM(1)/ESD(ga)/ESD(t) ID/IG/GG  
 ACCESSION NR: APh039648 S/0161/64/006/006/1649/1653

AUTHOR: Andreyeva, Ye. V.; Karlov, N. V.; Manenkov, A. A.; Milyayev, V. A.; Shirkov, A. V.

TITLE: Electron paramagnetic resonance of chromium ions in cadmium tungstate

SOURCE: Fizika tverdogo tela, v. 6, no. 6, 1964, 1649-1653

TOPIC TAGS: electron paramagnetic resonance, Czeochralaki method, spin lattice relaxation, spin Hamiltonian, chromium ion, cadmium tungstate

ABSTRACT: Samples were grown by the Czeochralaki method from pure fused  $\text{CdWO}_4$  to which  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$  had been added. The crystal thus obtained contained no  $\text{Cr}^{3+}$  ions, but after annealing in air for several hours at 700C, a transition to the trivalent state occurred. Electron paramagnetic resonance was observed in the temperature interval from 300 to 1.6K at frequencies from 9.4 to 98 gigacycles in magnetic fields ranging up to 10 kilogauss. The constants of the spin Hamiltonian for  $\text{Cr}^{3+}$

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L 20375-65

ACCESSION NR: APh039648

3  
were found to be  $D = 42.9 \pm 0.05$  gigacycles,  $E = 2.35 \pm 0.02$  gigacycles,  $g_x = 1.97 \pm 0.01$ ,  $g_y = 1.97 \pm 0.01$ , and  $g_z = 1.98 \pm 0.01$ . The spin-lattice relaxation time, measured when the magnetic field was parallel to z, was found to be 0.36 microseconds at 1.2 and 3.0 microseconds at 1.6k. This time dependence may be explained by direct resonance processes of relaxation if it is assumed that direct relaxation is forbidden between the lower investigated levels  $M = \pm 1/2$  and is allowed through the upper level  $M = 3/2$  at some distance d from the level  $M = 1/2$ . The value of d obtained from the equation for temperature dependence is 100 gigacycles; from spectroscopic data the splitting between the two levels ( $1/2$  and  $3/2$ ) proved to be 96 gigacycles, very near 100. This supports the view of a relaxation mechanism. The authors thank V. I. Orliko, who prepared the single crystals of  $GdWO_4$ , and L. N. Dan'yanets, who made the x-ray studies of the crystals." Orig.

art. has: 2 figures, 3 tables, and 2 formulas.

ASSOCIATION: Fizicheskii institut im. P. N. Lebedeva AN SSSR, Moscow (Physics Institute, AN SSSR)

Card 2/3

L 20375-65

ACCESSION NR: AP4039648

SUBMITTED: 13Dec63

SUB CODE: SS, NP

ENCL: 00

NO REF BOV: 003

OTHER: 008

Cord 3/3

KARLOV, Y.V.; MANENKOV, A.A.

Quantum paramagnetic amplifiers; review. Izv. vys. ucheb. zav.;  
radiofiz. 7 no.1:5-45 '64. (MIRA 17:3)

1. Fizicheskiy institut imeni Lebedeva AN SSSR.

L 00532-66

EWA(k)/FBD/EWT(1)/EWP(e)/EWT(m)/EEC(k)-2/EWP(1)/T/EWP(k)/EWA(h)/  
EWA(m)-2 IJP(c) WG/WH

ACCESSION NR: AP5022136

UR/0030/65/000/008/0082/0084

AUTHOR: Karlov, N. V. <sup>44</sup> (Candidate of physico-mathematical sciences)

TITLE: Soviet nonlinear laser work

SOURCE: AN SSSR. Vestnik, no. 8, 1965, 82-84

TOPIC TAGS: laser, <sup>25, 44</sup> ruby laser, gas laser, laser effect, laser conference, laser optics, solid state maser, photon, bremsstrahlung, Raman scattering, photoionization, radiation detector

ABSTRACT:

Recent Soviet work on nonlinear laser effects was the subject of a series of lectures held at the regular session of the Department of General and Applied Physics of the Academy of Sciences USSR on 14-15 April 1965. The purpose of the session was to evaluate past and current activities of the Oscillation Laboratory of the Lebedev Physics Institute. The Director of the Laboratory is A. M. Prokhorov. <sup>44</sup>

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L 00532-66

ACCESSION NR: AP5022136

Multiphoton processes were investigated by Prokhorov with F. V. Bunkin and P. P. Pashinin. Their experiments were claimed to be successful, mainly because of the availability of high-power ruby and neodymium glass lasers. The multiphoton photoconductive effect is primarily responsible for the power limit in lasers. In semiconductor lasers a two-photon ionization is possible which imposes a field stress limit within the semiconductor of  $4 \times 10^5$  v/cm. In ruby lasers the most likely process is three-photon ionization with a limit of  $4 \times 10^7$  v/cm. On the other hand, multiphoton processes may make it possible to design lasers utilizing two-photon transitions, capable of continuous frequency tuning.

The possibility of a stimulated bremsstrahlung effect has been investigated theoretically with a view to achieving negative absorption within a wide frequency range.

In the course of studying stimulated Raman scattering, the problem of exciting anti-Stokes and higher Stokes components has been solved. These components are emitted into narrow solid angles and have a high intensity.

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L 00532-66

ACCESSION NR: AP5022136

The theoretical requirement for photoionization of gas is an electric field strength of  $10^7$  v/cm, achievable by focusing a  $10^8$ -watt laser beam on a  $10^{-2}$ -cm spot. The first successful experiment was accomplished with xenon gas by N. B. Delone and G. S. Voronov at the Lebedev Institute. 16

It was established that multiquantum processes are not significant during the formation of an electron avalanche in a laser-induced gas breakdown. S. L. Mandel'shtam, P. P. Pashinin, A. M. Prokhorov, Yu. P. Rayzer, and N. K. Sukhodrev investigated such a breakdown, concentrating on the quasi-stationary and the afterglow stages of the spark formation. X-ray emission of the spark plasma indicated a maximum temperature of  $6-7 \times 10^5$ K. A shock-wave type of hydrodynamic mechanism was postulated.

High-power paramagnetic crystal lasers were investigated by A. A. Manenkov, T. M. Murina, A. M. Prokhorov, and G. P. Shipula. Given the usual.

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L 00532-66

ACCESSION NR: AP5022136

crystal sizes and flash tube intensities, ruby lasers may give output power as high as 40 kw for a pulse length of 1 millise. Giant pulses may reach  $10^9$  watts for  $6 \times 10^{-9}$  sec. Shorter pulses may be obtained with saturable filters. Power amplifiers using the same crystals as those in laser oscillators can increase the power output by an order of magnitude. The efficiency of paramagnetic lasers can be improved 10% by using a ruby laser, for example, to pump a  $\text{CaF}_2:\text{Sm}^{2+}$  laser.

N. A. Irsova<sup>y</sup>, N. V. Karlov, and A. M. Prokhorov are working on submillimeter lasers and radiation detectors. G. M. Zverev<sup>y</sup> and A. K. Shevchenko<sup>y</sup> of the Nuclear Physics Research Institute of Moscow State University have built a ruby maser operating at a 1-mm wavelength with a 0.1-watt output. The device is pumped by a ruby laser in a  $10^5$ -oe pulsed magnetic field. A xenon-krypton gas laser operating on a cw mode at  $75 \mu$  delivered  $10^{-9}$  watt. A highly sensitive photoconductive detector of wavelengths of 4 mm, 2 mm, 1 mm, and 0.5 mm was developed using indium antimonide cooled to 4.2K.

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L. 00532-66

ACCESSION NR: AP5022136

It was shown theoretically that the sensitivity of noncoherent detectors can be brought up to a single photon reliably recorded during the period of observation. New quasi-optical light guides have been developed in the form of a one-dimensional wire mesh with a pitch much smaller than the wavelength. These devices were used in the construction of polarizers, calibrated attenuators, and beam splitters. A reflecting-transmitting Fabry-Perot interferometer has been developed.

ASSOCIATION: none

SUBMITTED: 00

ENCL: 00

SUB CODE: EC, OP

NR REF SOV: 000

OTHER: 000

ATD Press: 4076-F

Card 5/5 *JW*

L 4190-66 EWA(k)/FBD/EWT(1)/ENP(e)/EWT(m)/EPF(c)/EEC(k)-2/ENP(i)/T/ENP(t)/ENP(b)/  
ENP(k)/EWA(m)-2/EWA(h) SCTB/LJP(c) WG/JD/WW/GG/WH

ACCESSION NR: AP5022745

UR/0181/65/007/009/2865/2866

AUTHOR: Karlov, N. V.; Krynetskiy, B. B.

TITLE: Inversion and line width of paramagnetic resonance absorption in chromium-containing rutile at 20-cm wavelengths

SOURCE: Fizika tverdogo tela, v. 7, no. 9, 1965, 2865-2866

TOPIC TAGS: quantum device, titanium dioxide, electron paramagnetic resonance, EPR, line width

ABSTRACT: The purpose of the study was to determine the dependence of the inversion and of the width of the EPR lines in chromium doped rutile on the  $\text{Cr}^{3+}$  concentration, in view of the use of this material in quantum amplifiers. The tests were made in the 20-cm band, which is of interest in radioastronomy. The external magnetic field was oriented along the c-axis of the tested crystals. The measurements were made at 4.2K. The  $\text{Cr}^{3+}$  content was 0.07, 0.1, 0.15, or 0.3%. At these concentrations the EPR line shape was intermediate between Gaussian and Lorentzian, and was found to be proportional to the square root of the concentration, as called for by the theory. The results are tabulated in the Enclosure. The inversion was deter-

Card 1/3

L 4190-66

ACCESSION NR: AP5022745

9  
mined at an auxiliary radiation frequency of 47 Gcs. The optimal concentration is 0.1%, at which the Q of the active medium, calculated from the inversion, concentration, and line width, is 80. Measurements with an actual quantum amplifier yielded  $Q = 70$ . It is concluded that rutile is a promising material for quantum amplifiers at 20 cm wavelengths. "The authors thank A. M. Prokhorov for interest in the work and R. P. Bashuk for supplying the rutile crystals." Orig. art. has: 2 tables. [02]

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR (Physics Institute, AN SSSR)

SUBMITTED: 16Apr65

ENCL: 01

SUB CODE: SS, OP

NO REF SOV: 004

OTHER: 002

ATD PRESS: 4121

Card 2/33

L 4190-66

ACCESSION NR: AP5022745

ENCLOSURE: 01

Table 1. Width of  $\text{Cr}^{3+}$  line as function of the concentration.

Concentration at. %	Measured line width	Calculated line width
	Mcs	
0.07	31	31
0.1	37	35
0.15	47	44
0.3	68	62

Table 2. Results of measurement of the inversion at different concentrations

Concentration at. %	Inversion	Inversion times concentr.
0.07	20	0.14
0.1	20	0.2
0.15	12	0.18
0.3	-1	-0.03

BVK  
Card 3/3

L 17116-65 EED-2/EEO-2/EWT(d) PJ-4/Pn-4 SSD/ASD(a)-5/AFWL/BSO/AFETR/  
AFTC(p)/RAEM(a)/RAEM(c)/RAEM(i)/ESD(ga)/ESD(t) JHB  
ACCESSION NR: AP5000447

S/0109/64/009/012/2088/2093

AUTHOR: Karlov, N. V.; Prokhorov, A. M.

TITLE: On the critical sensitivity of receivers of electromagnetic radiation

SOURCE: Radiotekhnika i elektronika, v. 9, no. 12, 1964, 2088-2093

TOPIC TAGS: submillimeter receiver, optical frequency receiver, superheterodyne receiver, receiver sensitivity, critical sensitivity, maser, laser

ABSTRACT: The limiting sensitivity of receivers is considered analytically for all frequencies in general, and for the submillimeter and optical frequencies in particular. N independent modes are assumed in the receiver. Special distinction is made of the case of linear reception of a coherent signal retaining phase information, where the sensitivity limit is imposed by the amplitude-phase ambiguity. Expressions are given showing that in the case of maser receivers at high pumping levels, the limiting sensitivity of coherent signal receivers does not depend upon frequency. The authors also consider the sensitivity of coherent receivers as a function of the number of modes. If the input system is designed to limit the propagation of a monochromatic signal to a single mode while noise is present in all the modes, the sensitivity of the receiver can be sharply improved. Orig. art. has: 23 formulas.

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L 17116-65

ACCESSION NR: AP5000447

ASSOCIATION: Fizicheskii Institut imeni P. N. Lebedeva AN SSSR (Institute of  
Physics, AN SSSR)

SUBMITTED: 19Feb64

ENCL: 00

SUB CODE: EC

NO REF SOV: 005

OTHER: 002

ATD PRESS: 5148

Cord 2/2



L 27223-65 EWG(j)/EWA(k)/TBD/EWT(1)/EEG(k)-2/EEG(t)/T/EEG(b)-2/EWP(k)/EWA(h)/EWA(m)-2  
Pn-l/Po-l/Pf-l/Peb/Pi-l/Pl-l IJP(c) WG

ACCESSION NR: AP5002897

S/0109/65/010/001/0040/0044

AUTHOR: Karlov, N. V.; Martirosyan, R. M.; Sorochenko, R. L.

TITLE: Effect of mismatch of antenna-feeder lines upon the frequency response  
of resonator-type quantum paramagnetic amplifiers <sup>54</sup><sub>43</sub><sub>B</sub>

SOURCE: Radiotekhnika i elektronika, v. 10, no. 1, 1965, 40-44

TOPIC TAGS: amplifier, quantum paramagnetic amplifier, maser amplifier

ABSTRACT: A theoretical and experimental investigation of the effect of mismatch of input (radio-reception) antenna-feeder channels upon the frequency response of quantum paramagnetic amplifiers (QPA) is reported. Formulas for the gain depending on the degree of mismatch for single- and two-circuit QPA's are developed; curves illustrating the effect of mismatch (various types of deformations) are plotted. A QPA with two active resonators was alternatively connected to differently matched loads; their voltage-standing-wave ratios were

Card 1/2

L 27223-65

ACCESSION NR: AP5002897

1.1 and 1.7. Oscillograms show experimental frequency response curves for various gains and decouplings. At a 20-db gain and a 35-db decoupling, the difference between 1.1 and 1.7 in voltage SWR becomes negligible. Orig. art. has: 6 figures and 9 formulas.

ASSOCIATION: none

SUBMITTED: 19Oct63

ENCL: 00

SUB CODE: EC

NO REF SOV: 003

OTHER: 000

Cord 2/2

L 2688-66 EWT(1)/EWA(h)  
ACCESSION NR: AF5021349

UR/0120/65/000/004/0144/0145  
621.372.8:621.315.61

AUTHOR: Dianov, Ye. M.; Irisova, N. A.; Karlov, N. V.

38  
37  
B

TITLE: Use of dielectric waveguides in millimeter-band spectroscopy

SOURCE: Pribery i tekhnika eksperimenta, no. 4, 1965, 144-145

TOPIC TAGS: waveguide, dielectric waveguide, circular waveguide, microwave spectroscopy

ABSTRACT: Waveguides made from solid, homogeneous, flexible polyethylene rods of circular cross section were used to excite EPR resonators submerged in liquid helium and to conduct energy to receiving elements based on semiconductor photoconductivity at liquid helium temperatures. The real and imaginary parts of the polyethylene refractive index were  $n = 1.51$  and  $k \approx 3 \cdot 10^{-4}$  (at  $\lambda = 2$  mm). Use of the waveguide made it possible to conduct tests with a single well-aligned, rigidly fixed emission source in several experimental arrangements. The focal spot ( $\sim 4$  mm) of the quasi-optical system excited a conical horn whose inlet aperture somewhat

Card 1/2

L 47059-65 EWT(1)/ZEC(b)-2/EWA(h) Pa-4/Feb/P1-4/P1-4/P1-4

ACCESSION NR: AP5010099

UR/0109/65/010/004/0673/0675

38  
B

AUTHOR: Karlov, N. V.; Martirosyan, R. M.

TITLE: One scheme of quantum paramagnetic amplifier with coupled resonators

SOURCE: Radiotekhnika i elektronika, v. 10, no. 4, 1965, 673-675

TOPIC TAGS: amplifier, quantum amplifier, paramagnetic amplifier

ABSTRACT: Characteristics of a quantum paramagnetic amplifier (QPA) with two parallel resonators are briefly considered on the basis of recently published Western and Soviet data. It is shown that a QPA with two-coupled resonators has the same noise as a single-circuit QPA. In the case of a common transformer primary, the two-parallel-resonator QPA has characteristics similar to those of a two-series-coupled-circuit QPA. Orig. art. has: 1 figure and 7 formulas.

ASSOCIATION: none

SUBMITTED: 19Feb64

ENCL: 00

SUB CODE: EC

NO REF SOV: 006

OTHER: 001

me  
Card 1/1

KAPLOW, N.V., *Scientific-technical*

Sessions of the Department of General and Applied Physics, Moscow USSR  
35 no. 2:32-37 kg 195. (MIRA 13:2)

KARLOV, N.V.; KROKHIN, O.M.

The physics Nobel Prize for 1964. Usp. fiz. nauk 85 no.2:387-389  
F '65. (MIRA 18:3)

L 26261-66 EWT(m)/EWP(t) IJP(c) JD

ACC NR: AP6013525

SOURCE CODE: UR/0120/66/000/002/0191/0194

AUTHOR: Karlova, Ye. K.; Karlov, N. V.

ORG: Physics Institute, AN SSSR, Moscow (Fizicheskiy institut AN SSSR)

TITLE: Millimeter-band receiver based on an InSb photoconductor

SOURCE: Pribery i tekhnika eksperimenta, no. 2, 1966, 191-194

TOPIC TAGS: crystal detector, photoresistor, photoconductor, indium alloy

ABSTRACT: The design and performance of a low-noise millimeter-wave receiver based on an InSb detector are described. The InSb element, which at liquid He temperature acts as a photoresistor to incident millimeter rf, was n-type, with a rated carrier mobility of  $3 \times 10^5$  cm<sup>2</sup>/v·sec, and was cut from a single crystal to dimensions of  $4 \times 1 \times 1$  mm. At an operating temperature of 4.2K, detector resistance was in the range of 130—150 ohms. The crystal, together with a carbon-ballast resistor, was mounted in a 3.2-mm diameter waveguide, which was fed by a klystron via a tapered polyethylene insert in the guide, and the assembly was immersed in the He cryostat (see Fig. 1). Special efforts were taken to shield the crystal and receiver circuitry because of the great sensitivity and bandpass of the InSb element. The incoming

Card 1/3

UDC: 539.28.078

L 26261-66

ACC NR: AP6013525

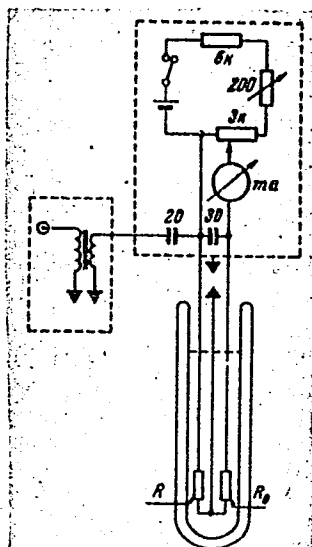


Fig. 1. Photoreistor supply mounting.

$R_0$  - InSb resistor;  
 $R$  - ballast resistor;

Card 2/3

signal was dual-modulated: at 72 cps by oscillation of a slot attenuator in the guide and at 3 kc by modulation of the klystron supply voltage. By also using synchronous detection and low-noise receiver components, the authors obtained reception considerably better than that of usual (type D-407) crystal diodes, under the same test conditions. The relative improvement in sensitivity of the InSb element varied from 20 db at  $\lambda = 4$  mm to 3 db at  $\lambda = 0.6$  mm; by lowering the He temperature to 1.8K, these gains could be improved another 3—5 db. The stability and zero drift of this receiver were considered very good, with consistency of data maintained over several months of operation, provided the copper leads to the crystal were not resoldered. However, the InSb element was found to lose its sensitivity several months after being removed from the receiver. The authors conclude that their receiver is comparable in sensitivity to some of the best present superhet types in the millimeter band, and they suggest that it can be used in radiospectroscopy and radioastronomy. "The authors are extremely



L 26261-66

ACC NR: AP6013525

4  
grateful to A. M. Prokhorov for his attention, advice, and fruitful suggestions, as well as to Ye. A. Vinogradov, Ye. M. Dianov, and N. A. Irisova, for permitting the use of their measuring apparatus." [SH]  
Orig. art. has: 2 figures and 2 formulas.

SUB CODE: 09/ SUBM DATE: 06Apr65/ ORIG REF: 006/ OTH REF: 005  
ATD PRESS: 42.43

Card 3/3 CC

L 26367-66 EWT(1)/EWT(m)/EWA(d)/EWP(t) IJP(c) JD

ACC NR: AP6012497

SOURCE CODE: UR/0181/66/008/004/1265/1267

AUTHOR: Agranovskaya, A. I.; Karlov, N. V.; Krynetskiy, B. B.

ORG: Physics Institute im. P. N. Lebedev AN SSSR, Moscow (Fizicheskiy institut AN SSSR)

TITLE: Effect of temperature on line width and resonance field of ferromagnetic resonance in polycrystalline specimens of  $\text{Ca}_3\text{V}_{1.5}\text{Fe}_{3.5}\text{O}_{12}$

SOURCE: Fizika tverdogo tela, v. 8, no. 4, 1966, 1265-1267

TOPIC TAGS: ferromagnetic resonance, low temperature effect, SHF, ferrite, line width, magnetic anisotropy

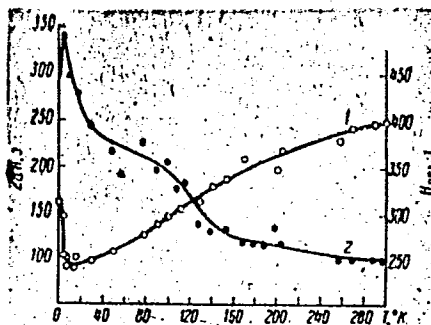
ABSTRACT: The ferromagnetic properties of  $\text{Ca}_3\text{V}_{1.5}\text{Fe}_{3.5}\text{O}_{12}$  are studied in an attempt to determine the possibilities for using this material in SHF ferrite devices which operate at low temperatures. Line width and resonance field were measured as functions of temperature in polycrystalline specimens of this ferrite. Powder metallurgy methods were used for making the specimens. The results show an increase in line width and reduction in field intensity at low temperatures (see figure). These phenomena may be due to an increase in the magnetic anisotropy of the crystal. The temperature curve for the line width shows two maxima: the first at 4°K and the second at 7-100°K. The first is apparently due to rapid relaxation of bivalent iron ions

Card 1/2

L 26367-66

ACC NR: AP6012497

Temperature curve for resonance field intensity (1) and line width (2) of a polycrystalline specimen of  $\text{Ca}_3\text{V}_{1.5}\text{Fe}_{3.5}\text{O}_{12}$ .



while the second is probably associated with another phase. The rather narrow ferromagnetic resonance line at helium temperatures indicates that these ferrites may be used in low-temperature SHF devices. The authors thank A. M. Prokhorov for interest in the work and V. I. Solov'yev for discussion of problems encountered in this work.

SUB CODE: 20/

SUBM DATE: 13Oct65/

ORIG REF: 003/

OTH REF: 003

Card 2/2 *CC*

L 21511-66 EWT(1)/EWA(h)  
ACC NR: AP6007504

SOURCE CODE: UR/0109/66/011/002/0271/0278

AUTHOR: Karlov, N. V.

ORG: Institute of Physics, AN SSSR (Fizicheskiy institut AN SSSR)

TITLE: Q-factor of active material in quantum amplifiers <sup>25</sup>

SOURCE: Radiotekhnika i elektronika, v. 11, no. 2, 1966, 271-278

TOPIC TAGS: Q factor, quantum device, three level quantum amplifier

ABSTRACT: The problem of determining the complex Q of the active material is reduced to calculating the nondiagonal element of a density matrix  $\rho_{22} = \rho_{23}^*$  which corresponds to the signal transition. This formula for susceptibility is derived:

$\chi_{23} = (|\mu_{23}|^2 / \hbar) N \chi_{23}$ . On its basis, the effect of the intensity and frequency of auxiliary pump signal upon the real and imaginary components of Q is found. With sufficiently deep saturation of the auxiliary transition ( $S \gg 1$ ), the phase and amplitude of  $1/Q$  depend on the parameters of the auxiliary pump signal in the order of  $T_2/T_1$ ; the effect of pumping instability is alleviated in that ratio. Here,  $T_1 \approx 0.1-0.001$  sec and  $T_2 \approx 10^{-8}$  sec are two relaxation times of the active material in a quantum paramagnetic amplifier. "The author wishes to thank A. M. Prokhorov who stimulated the execution of this work and offered valuable advice." Orig. art. has: 35 formulas.

[03]

SUB CODE: 09 / SUBM DATE: 10May65 / ORIG REF: 002 / OTH REF: 004 / ATD PRESS: 4222  
Card 1/1 ULR UDC: 621.378.5.001